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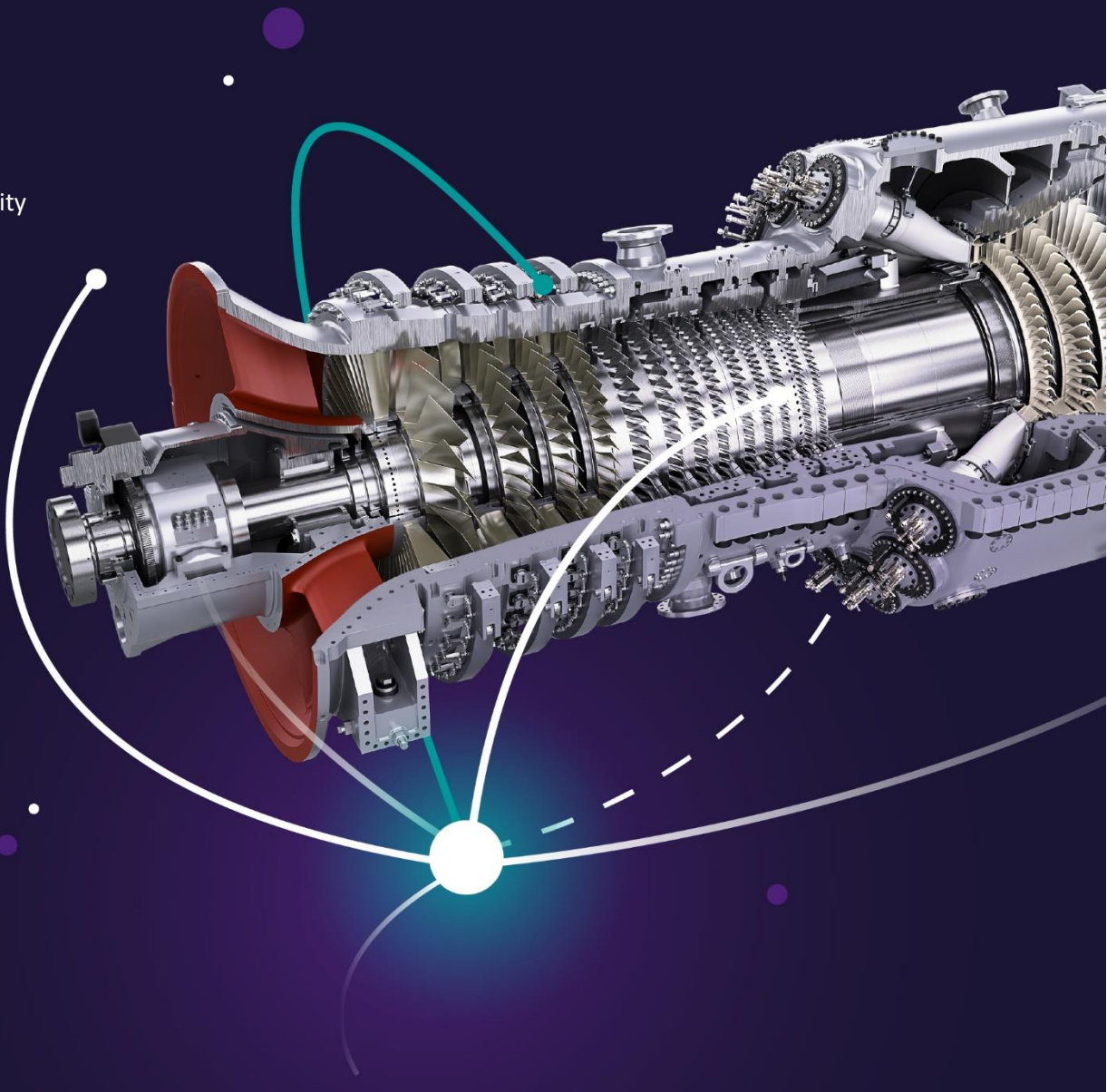
Product Bulletin

SGT6-8000H - Wet Compression (WetC)

Power

Flexibility

Sustainability



Product Bulletin | PB3-23-0127-GT-EN-01

SGT6-8000H - Wet Compression (WetC)

On-Demand Power Upgrade Throughout Broad Range of Ambient Conditions

Power
- Power Output

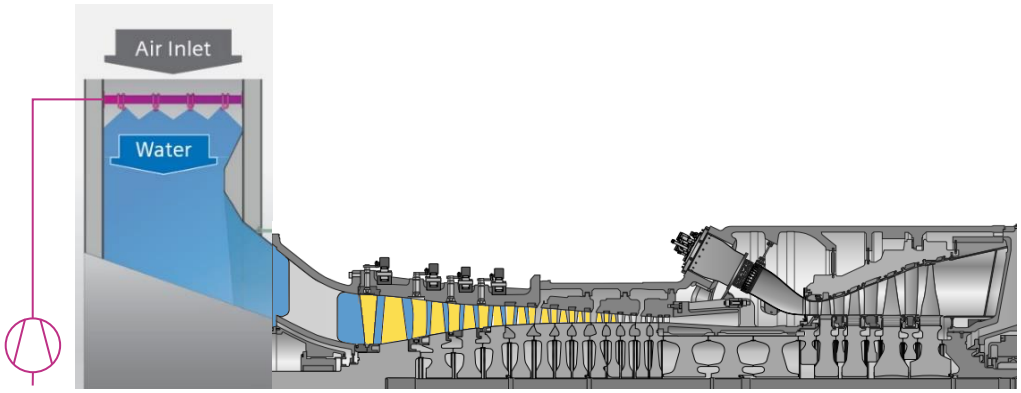
Flexibility
- Operational Flexibility

Sustainability
- Operational Emissions

Summary

Siemens Energy's Wet Compression upgrade is designed to help Customers in a capacity market, peak market, and hot ambient environment to **maximize power plant revenue**. This upgrade is a verified method to generate additional power during base load operations. Wet Compression upgrade is intended to help take advantage of high peak electricity prices and compensate for lower power during hot ambient conditions.

The upgrade is designed to increase the gas turbine power output above base load for a period of time, by reducing compressor inlet temperature, intercooling the air mass flow within the compressor section, and subsequently increase mass flow through the turbine. It introduces demineralized water into the gas turbine inlet to enhance **power output** and **operational flexibility**.



SGT6-8000H WetC Illustration

Est. lead time
6 months

Min. event type
Combustor/Minor

Fleet experience
> 5 units

AL: N, ECCN: EAR99
Confidential Information

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Our Solution

This upgrade is intended to increase the power output of the Gas Turbine (GT) by increasing mass flow and intercooling the compressor. By improving the compressor efficiency and turbine power output, more torque can be available to turn the generator, which can potentially increase the overall electrical output of the plant.

Since every plant site is different, the process starts with site specific engineering. This helps Siemens Energy to maximize performance for individual sites. One element critical to this evaluation is the performance of a computational fluid dynamics (CFD) analysis that is intended to provide a site-specific design of the spray rack and header for optimum performance.

Control system integration is incorporated to allow operation of the system from the control room.

Additionally, Siemens Energy can perform tuning of the GT to help optimize performance of the Wet Compression system.

Unlike other inlet cooling systems that are on/off, the Wet Compression system is adjustable which is intended to provide the required MW. Figure 1 provides a brief description of the differences.

Wet Compression is applicable to be utilized only during times when the ambient temperature is at or above **10°C (50°F)** and is applicable to SGT6-8000H & SGT5-8000H frames and is intended as a peaking power solution.

Intended Benefits*

The WetC system is intended to improve gas turbine power output. Actual results will depend on ambient conditions and water mass flow. For the SGT6-8000H, the benefits can potentially include:

- Increased GT power output up to 10% during Wet Compression operations with the potential to:
    - Capture capacity payments
    - Capture net generation above base load during periods of operations
    - Compensate for power reduction during hot-ambient conditions
- Higher exhaust energy for increased steam production in combined cycle operations
- Increased operational flexibility from power on-demand.
- Improved NOx emissions may be possible during Wet Compression operation.

*While operating Wet Compression, the overall combined cycle plant heat rate is expected to increase. Siemens Energy can perform a site-specific evaluation to quantify impacts

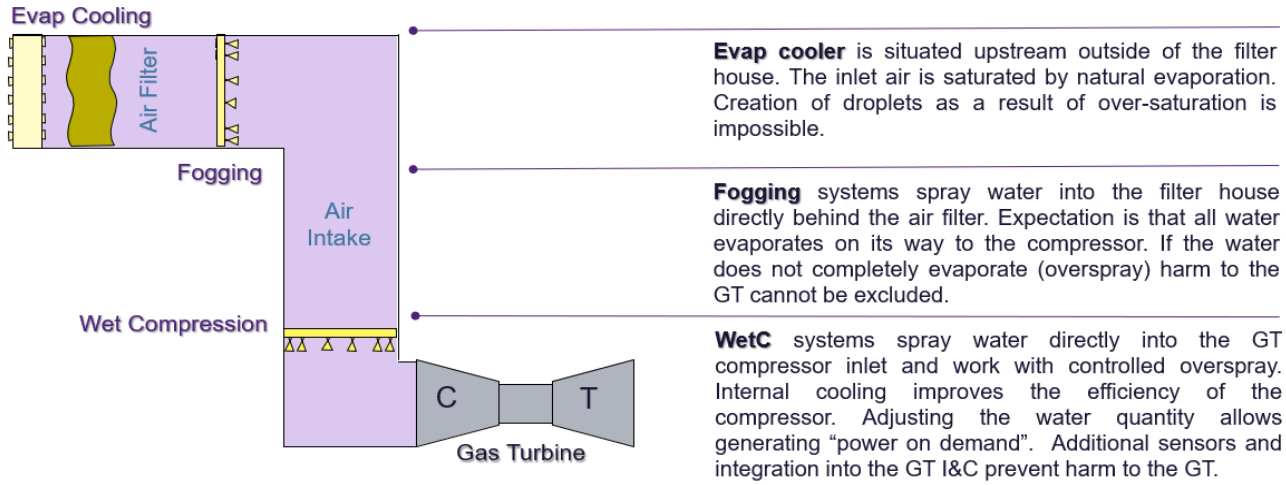


Figure 1: Generic Inlet Cooling System Comparison

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Economic Value

The addition of a Wet Compression system can be economically attractive for a variety of operational profiles.

Power plants in hot weather areas, where the power price frequently spikes, may find that this option potentially helps increase revenue by producing more power during peak power pricing. For example, SGT6-8000H gas turbine that operates the Wet Compression system for 1000 hours in a year could potentially generate approximately $1.25M in additional revenue. *

Power plants in capacity markets may be able to take advantage of additional capacity payments per year. Installing a Wet Compression system provides the potential to re-rate the power plant and capture capacity payments. A plant that increases plant output by 25MW in a typical capacity market could potentially generate an additional $1M in revenue annually. *

The more hours per year the system is used, within design limits, the better the revenue potential.

Wet Compression operations requires availability of demineralized water.

Below in Figure 2 is an example of annual added value that SGT6-8000H Wet Compression can provide. *

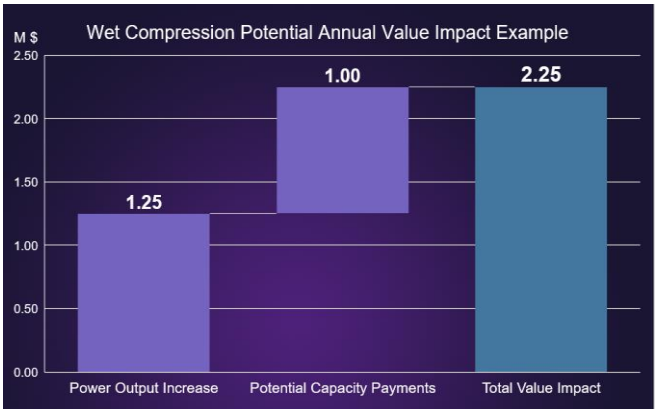


Figure 2: **Assumptions:** Yearly WetC Operating Hours: 1000, Electricity price [$/MWh]: 50, GT Output Increase [MW]:25

*Potential value impact will vary depending on site-specific factors.

Technical Background

The Wet Compression system is designed to increase GT power. High pressure demineralized water is injected directly into the inlet air stream of the compressor.

The potential increase in performance from Wet Compression comes from the increase in mass flow and the intercooling effect within the compressor.

The amount of power increase directly attributed to the added mass flow varies by frame and specific application. This increased mass flow can also result in increased exhaust energy for combined cycle applications.

An increase in both performance and efficiency can potentially be achieved due to a reduction in the compressor inlet temperature (CIT) through evaporation of the water droplets.

Coating compressor blades and vanes and, if necessary, coating the inlet duct section down-stream from the spray rack of the unit, is recommended to help address potential compressor component erosion.

The implementation of the Wet Compression upgrade includes the following Scope:

- Pump Skid – high pressure supply
- Inter-Connecting Piping – between the pump skid and spray rack headers
- Inlet Duct and Manifold Drains – intended to remove any water once the gas turbine stops or the water level is sufficient to overcome the vacuum created by the engine.
- Spray Rack, Header Manifolds and Nozzles, to supply and atomize the demineralized water
- Coating is applied to compressor blades and vanes for corrosion resistance. It also may be applied to the inlet duct section down-stream from the spray rack if necessary.
- *Control Logic Integration* – to automate the operational system control parameters and for more reliable operation

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Recommendations

A plant assessment with a site walk-down is recommended to review gas turbine and Balance-of-Plant (BoP) equipment to assess potential Wet Compression applicability including consideration of any:

- Generator limits
- Transformer limits
- HRSG limits
- Combustion instabilities/limitations
- Hardware limitations
- Emissions limitations

Notes

Our experienced service team is ready to assist you in deciding which solution is the right one for you. With our specialists in engineering, manufacturing and/or field service in close collaboration, we can offer optimum service solutions for your power plant to match your specific demands.

Please do not hesitate to contact your local Siemens Energy representative for further information.

Visit our Customer Energy Portal:

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Siemens Energy Global GmbH & Co. KG
Otto-Hahn-Ring 6
81739 München
Germany

Siemens Energy Inc.
4400 N Alafaya Trail
Orlando, FL 32826
USA

For more information, please visit our website:
www.siemens-energy.com

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